**Citation:**

Drouillet P, Kaminski M, De Lauzon-Guillain B, Forhan A, Ducimetière P, Schweitzer M, Magnin G, Goua V, Thiébaugeorges O, Charles MA. Association between maternal seafood consumption before pregnancy and fetal growth: evidence for an association in overweight women. The EDEN mother-child cohort. *Paediatr Perinat Epidemiol.* 2009 Jan;23(1):76-86.

**PubMed ID:** 19228317

**Study Design:**

Prospective Cohort Study

**Class:**

B - Click here for explanation of classification scheme.

**Research Design and Implementation Rating:**

POSITIVE: See Research Design and Implementation Criteria Checklist below.

**Research Purpose:**

The purpose of the study was to explore the relationship between seafood consumption before and during pregnancy and fetal growth in a French population, with the particular aim of assessing the possible effect of maternal overweight on this relationship.

**Inclusion Criteria:**

- Pregnant women attending for prenatal visits at the departments of Obstetrics and Gynecology of the University Hospitals of Nancy and Poitiers before 24 weeks of gestation
- Signed written consents were obtained from the mother and then for her newborn child after delivery

**Exclusion Criteria:**

- Twin pregnancies
- Known diabetes before pregnancy
- Not being able to speak or read French
- Intention to move away from the region

**Description of Study Protocol:**

**Recruitment:** Pregnant women attending for a prenatal visit at the departments of Obstetrics and Gynecology of the University Hospitals of Nancy and Poitiers before 24 weeks of gestation were invited to participate. Enrollment started in 2003 in February in Poitiers and in September in Nancy; it lasted 27 months in each center and included 2002 women.

**Design:** Prospect Cohort study

**Blinding used (if applicable):** Implied for data analysis

**Intervention (if applicable):** Not applicable

**Statistical Analysis:**

- Student's *t*-test - used to compare the mean frequency of monthly seafood servings.
- Linear regression - used to study the relationships between sociodemographic characteristics of women and seafood consumption.
- Multiple linear regression - used to study the relationship between seafood consumption and variables (fetal growth characterized by anthropometric measures at birth and ultrasound measures).

**Data Collection Summary:**

**Timing of Measurements:**

- Standard ultrasound fetal measurements were recorded from routine examinations performed at 20 to 24 and 30 to 34 weeks of gestation
- At a visit performed between 24 and 28 weeks of gestation by midwife research assistant obtained the following information: height, skinfolds, systolic and diastolic blood pressure and glucose load. Weight before pregnancy, educational level and smoking habits during pregnancy were obtained by interview
- A second visit was performed by the same research assistants 1.8 days (range 0-16) after delivery. Mother's weight and skinfolds were obtained. Several anthropometric measurements were performed on the newborn; left arm circumference, left wrist circumference, head circumference and skinfolds
- Food frequency questionnaires were completed at recruitment (concerning the usual diet during the year before pregnancy) and after the first few days following delivery (concerning food intake during the last 3 months of pregnancy).

**Dependent Variables:**

- Fetal growth
    - Gestation age at delivery
    - Birth Weight
    - Recombent length
    - Placenta weight

**Independent Variables:**

- Seafood consumption before and during pregnancy
- Maternal overweight

**Control Variables**

- Adjustments were made for center and mother's age

**Description of Actual Data Sample:**

**Initial N:** 2002 women (969 women in Poitiers and 1033 in Nancy)

**Attrition (final N):** 1805 women

**Age:** 29.1 ± 4.9 years

**Ethnicity:** French women

**Other relevant demographics:**

- 27.4% of women had an income >€3000/month (%)
- 7% of women were single
- 26% of women smoked during pregnancy

Adjustments were made for educational level, maternal food consumption and maternal health.

**Anthropometrics:**

- Prepregnant BMI was 23.2 ± 4.5
- Height (m) was 1.64 ± 0.06
- 26.2% of women were overweight

**Location:** Poitiers and Nancy, France

**Summary of Results:**

**Key Findings:**

- There was no association between seafood intake and fetal growth in the whole sample of women
- Mean birthweight was significantly greater with higher seafood consumption in overweight women whereas this relation was not observed in non-overweight women
- In non-overweight women, fetal growth was not associated with seafood consumption prior to pregnancy, whereas in overweight women, fetal growth was significantly associated with seafood consumption prior to pregnancy
- In overweight women, a difference in pre-pregnancy seafood consumption from less than 5 times/month to more than 9 times/month was associated with an average increase in birthweight of 5.1%, height of 1.4%, head circumference of 1.3%, arm circumference of 4.4% and wrist circumference of 3.2%. In addition, the sum of skinfolds was also greater; a mean difference of 8.0% was observed between the two extreme tertiles
- From the lowest to the highest tertiles, mean birthweight was 167 g higher (P = 0.002)
- A subsequent adjustment for total energy, lipid or alcohol intakes did not change the measurement of association
- Risks for large- or small-for-gestational age neonates did not vary according to seafood intake in all women or in non-overweight women
- No association was found between seafood intake and placental weight or length of gestation.

**Adjusted newborn and ultrasound anthropometric measures according to average seafood intake per month before pregnancy (n=1805)**

| | | Tertile 1 | Tertile 2 | Tertile |
|---|---|---|---|---|
| | | <5 times/month | 5-9 times/month | >9 times/month |
| At birth | | | | |

| | | | |
|---|---|---|---|
| Birthweight | | | |
| *n* | 563 | 642 | 597 |
| Mean | 3270 | 3292 | 3290 |
| SE | 16.5 | 15.4 | 16.0 |
| *P*=0.56 | | | |
| Birth length (cm) | | | |
| *n* | 555 | 626 | 574 |
| Mean | 49.54 | 49.51 | 49.62 |
| SE | 0.08 | 0.07 | 0.08 |
| *P*=0.54 | | | |
| Head circumference (cm) | | | |
| *n* | 545 | 606 | 561 |
| Mean | 34.53 | 34.62 | 10.41 |
| SE | 0.05 | 0.04 | 0.04 |
| *P*=0.30 | | | |
| Arm circumference (cm) | | | |
| *n* | 545 | 603 | 561 |
| Mean | 10.36 | 10.40 | 10.41 |
| SE | 0.04 | 0.04 | 0.04 |
| *P*=0.56 | | | |
| Wrist circumference (cm) | | | |
| *n* | 543 | 604 | 560 |
| Mean | 7.89 | 7.92 | 7.93 |
| SE | 0.02 | 0.02 | 0.02 |
| *P*=0.32 | | | |
| Sum of skinfolds (mm) | | | |
| *n* | 542 | 602 | 560 |
| Mean | 8.67 | 8.79 | 8.71 |
| SE | 0.07 | 0.07 | 0.07 |
| *P*=0.49 | | | |

| | | | |
|---|---|---|---|
| 20-24 weeks of gestation | | | |
| Biparietal diameter (mm) | | | |
| *n* | 555 | 637 | 588 |
| Mean | 54.66 | 54.75 | 54.65 |
| SE | 0.12 | 0.11 | 0.11 |
| *P*=0.79 | | | |
| Head circumference (mm) | | | |
| *n* | 528 | 614 | 577 |
| Mean | 199.4 | 200.3 | 199.9 |
| SE | 0.50 | 0.46 | 0.47 |
| *P*=0.40 | | | |
| Abdominal circumference (mm) | | | |
| *n* | 532 | 616 | 581 |
| Mean | 178.2 | 178.7 | 179.5 |
| SE | 0.45 | 0.41 | 0.43 |
| *P*=0.09 | | | |
| Femoral length (mm) | | | |
| *n* | 550 | 634 | 586 |
| Mean | 38.89 | 38.77 | 38.87 |
| SE | 0.09 | 0.08 | 0.09 |
| *P*=0.56 | | | |
| 30-34 weeks of gestation | | | |
| Biparietal diameter (mm) | | | |
| *n* | 548 | 621 | 574 |
| Mean | 82.69 | 82.84 | 82.95 |
| SE | 0.16 | 0.15 | 0.15 |
| *P*=0.50 | | | |
| Head circumference (mm) | | | |
| *n* | 533 | 607 | 566 |
| Mean | 298.1 | 298.3 | 297.4 |

| | | | |
|---|---|---|---|
| SE<br>*P*=0.56 | 0.16 | 0.60 | 0.62 |
| Abdominal circumference (mm)<br>*n*<br>Mean<br>SE<br>*P*=0.38 | <br>532<br>283.8<br>0.67 | <br>614<br>282.7<br>0.62 | <br>564<br>283.8<br>0.65 |
| Femoral length (mm)<br>*n*<br>Mean<br>SE<br>*P*=0.17 | <br>544<br>62.07<br>0.11 | <br>618<br>61.81<br>0.10 | <br>571<br>62.04<br>0.11 |

**Author Conclusion:**

A higher consumption of seafood before pregnancy was associated with fetal growth, in overweight women only. This relationship included birthweight; birth length; head, arm and wrist circumferences and sum of skinfolds with a similar trend for some ultrasound measures.

***Reviewer Comments:***

***Research Design and Implementation Criteria Checklist: Primary Research***

**Relevance Questions**

| | | |
|---|---|---|
| 1. | Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies) | Yes |
| 2. | Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about? | Yes |
| 3. | Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice? | Yes |
| 4. | Is the intervention or procedure feasible? (NA for some epidemiological studies) | Yes |

| Validity Questions | | |
|---|---|---|
| **1.** | **Was the research question clearly stated?** | Yes |
| 1.1. | Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified? | Yes |
| 1.2. | Was (were) the outcome(s) [dependent variable(s)] clearly indicated? | Yes |
| 1.3. | Were the target population and setting specified? | Yes |
| **2.** | **Was the selection of study subjects/patients free from bias?** | Yes |
| 2.1. | Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study? | Yes |
| 2.2. | Were criteria applied equally to all study groups? | Yes |
| 2.3. | Were health, demographics, and other characteristics of subjects described? | Yes |
| 2.4. | Were the subjects/patients a representative sample of the relevant population? | Yes |
| **3.** | **Were study groups comparable?** | Yes |
| 3.1. | Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT) | Yes |
| 3.2. | Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline? | Yes |
| 3.3. | Were concurrent controls used? (Concurrent preferred over historical controls.) | N/A |
| 3.4. | If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis? | Yes |
| 3.5. | If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.) | N/A |
| 3.6. | If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")? | N/A |
| **4.** | **Was method of handling withdrawals described?** | Yes |
| 4.1. | Were follow-up methods described and the same for all groups? | Yes |

| | | |
|---|---|---|
| 4.2. | Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.) | Yes |
| 4.3. | Were all enrolled subjects/patients (in the original sample) accounted for? | Yes |
| 4.4. | Were reasons for withdrawals similar across groups? | Yes |
| 4.5. | If diagnostic test, was decision to perform reference test not dependent on results of test under study? | N/A |
| **5.** | **Was blinding used to prevent introduction of bias?** | Yes |
| 5.1. | In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate? | N/A |
| 5.2. | Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.) | Yes |
| 5.3. | In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded? | Yes |
| 5.4. | In case control study, was case definition explicit and case ascertainment not influenced by exposure status? | N/A |
| 5.5. | In diagnostic study, were test results blinded to patient history and other test results? | N/A |
| **6.** | **Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?** | Yes |
| 6.1. | In RCT or other intervention trial, were protocols described for all regimens studied? | N/A |
| 6.2. | In observational study, were interventions, study settings, and clinicians/provider described? | Yes |
| 6.3. | Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect? | Yes |
| 6.4. | Was the amount of exposure and, if relevant, subject/patient compliance measured? | N/A |
| 6.5. | Were co-interventions (e.g., ancillary treatments, other therapies) described? | N/A |
| 6.6. | Were extra or unplanned treatments described? | N/A |
| 6.7. | Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups? | N/A |
| 6.8. | In diagnostic study, were details of test administration and replication sufficient? | N/A |
| **7.** | **Were outcomes clearly defined and the measurements valid and reliable?** | Yes |

| | | |
|---|---|---|
| 7.1. | Were primary and secondary endpoints described and relevant to the question? | Yes |
| 7.2. | Were nutrition measures appropriate to question and outcomes of concern? | Yes |
| 7.3. | Was the period of follow-up long enough for important outcome(s) to occur? | Yes |
| 7.4. | Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures? | Yes |
| 7.5. | Was the measurement of effect at an appropriate level of precision? | Yes |
| 7.6. | Were other factors accounted for (measured) that could affect outcomes? | Yes |
| 7.7. | Were the measurements conducted consistently across groups? | Yes |
| **8.** | **Was the statistical analysis appropriate for the study design and type of outcome indicators?** | Yes |
| 8.1. | Were statistical analyses adequately described and the results reported appropriately? | Yes |
| 8.2. | Were correct statistical tests used and assumptions of test not violated? | Yes |
| 8.3. | Were statistics reported with levels of significance and/or confidence intervals? | Yes |
| 8.4. | Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)? | N/A |
| 8.5. | Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)? | Yes |
| 8.6. | Was clinical significance as well as statistical significance reported? | Yes |
| 8.7. | If negative findings, was a power calculation reported to address type 2 error? | N/A |
| **9.** | **Are conclusions supported by results with biases and limitations taken into consideration?** | Yes |
| 9.1. | Is there a discussion of findings? | Yes |
| 9.2. | Are biases and study limitations identified and discussed? | Yes |
| **10.** | **Is bias due to study's funding or sponsorship unlikely?** | Yes |
| 10.1. | Were sources of funding and investigators' affiliations described? | Yes |
| 10.2. | Was the study free from apparent conflict of interest? | Yes |